DOCUMENT RESUME

ED 176 215 CS 004 957

AUTHOR Byrne, Brian
TITLE Learning to Read: A Discontinuous Imposition upon Language Acquisition.
PUB DATE Jun 79
NOTE 12p.; Paper presented at the Biennial Meeting of the International Society for the Study of Behavioural Development (5th, Lund, Sweden, June 1979)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Cognitive Development; Early Childhood Education; *Language Development; *Linguistics; Orthographic Symbols; *Reading Difficulty; *Reading Research; *Reading Skills; Written Language
IDENTIFIERS Oral Language

ABSTRACT

In arguing that language as speech is to be contrasted with language as writing, this paper examines some facts about the evolution of writing systems, draws upon some experimental studies, discusses the difference between speech and writing as being one of status within human cognitive structure, and notes that the difference may help explain why some children are poor readers. In discussing the history of orthography, it points out that as contrasted with pictographic orthography, the development of sound-based orthographies has been slow and laborious. The paper continues by pointing to research using experiments designed to show what kind of storage children use to remember words (meaning or phonetic) that indicates that language acquisition develops with cognitive maturity. The reported research suggests that children who are poor readers have weaker phonetic storage ability than better readers, and that when phonemes have meaning the phonetic memory is even weaker for poor readers. The paper suggests that reflecting upon surface features of language does not come naturally to people and that symbolic systems that tap into language at that level (such as writing and reading) pose greater cognitive demands than may appear superficially. (TJ)

**********
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
**********

Learning to Read: A discontinuous imposition upon language acquisition.

A paper presented to the Fifth Biennial Conference of the International Society for the Study of Behavioural Development

Lund, Sweden, June 1979.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
Brian Byrne
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

Brian Byrne

University of New England, Armidale, Australia, 2351.

ED176215

The central point I wish to make in this paper is one of contrast - between language as speech and language as writing. I wish to draw upon some facts about the evolution of writing systems as well as upon experimental studies in my and others' laboratories, mostly with children. The difference, I believe, is not simply of ear and mouth on the one hand, versus eye on the other, but of status within cognitive structure. Further, I think that the distinction is most clearly in evidence during the acquisition phases of both procedures, and may even go part of the way to account for difficulties some children experience in learning to read.

To give the flavor of what I want to say, and without justification at this stage, here are two lists of adjectives which approximately describe the nature of language development and of learning to read. Learning to speak and understand speech is gradual, natural, unconscious and maturationally governed. Reading acquisition, on the other hand, can be seen as relatively sudden, contrived, deliberate and (beyond some minimum) independent of age. To put things in a slightly different way, I do not think that the human brain would have supported either a spoken or written language as easily as each other (with speech winning out for some such reason as it can be effectively done in the dark), but rather that spoken language occupies a central place in human mental function, writing being a further development out of speech, an invention as it were based upon a part of nature.

## Lessons from the history of orthography

Much remains obscure about how writing developed, but some observations, pertinent to my point of view, can be made with reasonable certainty. One is that the vast majority of language communities have never created their own orthography. It is true that much of the human population is literate

CS004957

but this is due to the fact that a handful of languages, which happen to have written forms, are very widely spoken, and to the fact that orthographies for a large number of languages have been invented by outsiders, e.g. missionaries, who had an interest in having permanent records of some word or another. Secondly, the development of a full sound-based orthography has been slow, laborious, and, one might even say, reluctantly executed. Orthographies can be divided into those which signify meaning directly (pictographic systems), those which have symbols representing whole words (often conventionalized pictographies), and those whose signs represent sounds of the language (syllabaries like Japanese, and alphabets). Figure 1 contains examples. This is also the order in which the various systems appear, and it seems that each advance, embodying a further step away from the direct representation of meaning and towards the representation of sound, was undertaken as the result of

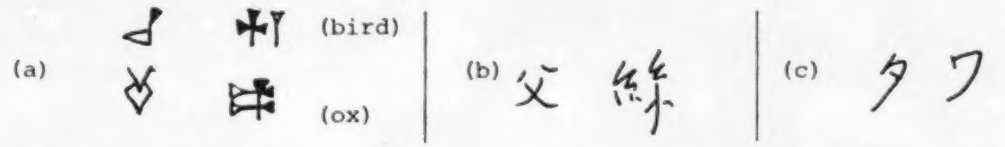


Figure 1. Examples of orthographic systems:
(a) Pictographs and derived cuneiform signs.
(b) Logography: modern Chinese signs for "father" and "silk".
(c) Syllabary: Japanese katakana signs for "tau" and "wa".

relatively trivial pressures of usage rather than as the creation of fertile and penetrating insights into the possible forms writing could take, along with some sensible assessment of the most adequate system. For example, the shift from pictorial representation to the more arbitrary and standardized forms of cuneiform writing seems to have been dictated by ease of production of the signs (by wedges into wet clay). Yet cutting writing loose from pictures, i.e. introducing arbitrariness into the symbols, represents a conceptual leap in that it provides the potential for further developments (e.g. the chance to write abstract nouns and grammatical function words, which have no picturable referents). In a similar vein, the move from pictographic and logographic writing to the more flexible sound-based syllabary (more flexible in that it provides a systematic way to write down anything that can be said in the language,

not just things that can be pictured) appears in large part to have been motivated by the need to record proper names, for purposes of trade and commerce. Picture-derived systems can cope with names like "Running Bear" and "Speedy Horse" adequately, but clearly come to grief over "The Lord has mightily blessed us", and the like. Again, this conceptual advance seems to have been forced upon the writing users rather than to have arisen from spontaneous contemplation of the logic of symbolic systems for language. Thirdly, some orthographies never progressed beyond a pictorial system or some close derivative. Gelb (1952) has collected examples of "semasiographies" - systems which can express meaning directly, without an intervening linguistic form - which did not form the basis of further developments in the direction of sound writing. The Mayan and Aztec scripts are examples.

All this suggests to me that thinking about language, especially about its sounds, as distinct from using it for expression and communication, does not come naturally to people. If it did one might expect evidence of more widespread and rapid development of the full writing systems, given the obvious advantage flowing from such an invention - advantages in record keeping, in recording legends and stories and family trees, and so on. To put matters rather too extremely, the emergence of writing looks more like the development of, say, the tape recorder, with all the attendant insights into obscure principles of physics which were needed, than something which flowed easily and naturally out of the human mind. The principles of physics do not; nor, it seems, do the principles of sound-writing.

Lessons from experimental psychology

I now turn to a review of some experimental work which, I believe, is consistent with the view of the cognitive status of orthography I have just outlined.

Although we have as yet little idea of why and how children learn to talk and to understand what is said to them, it remains true that by about age five they have mastered a system of such great complexity that whole departments full of linguists beavering away at its structure have yet to come up with a complete characterization of a single such system. There is now considerable evidence that language acquisition proceeds with great regularity, under the control of the maturing nervous system

(Lenneberg, 1967, provides the first major, and most complete, statement to this effect). Further, while "stages" such as the one-word, the two-word, etc., have been recognized as convenient milestones for purposes of discussion and comparison, there is a widespread feeling that, cognitively, there is a good deal of shading from one stage to the next. There are no easily identifiable cognitive leaps involved in language acquisition. What is also true, however, is that most children (and, indeed, most adults) have little insight into how the system operates. People are linguistically competent, but "metalinguistically" ignorant, failing to contemplate language as an object. Rozin and Gleitman (1977) have summarized much of the available evidence on the ways in which children emerge as grammarians to achieve the relatively fragmentary insights into language structure that they do. It seems that the more superficial the level, the more opaque it remains. Children can talk about meaning before syntax, and syntax before phonology. And while most articulate adults could give some account of, say, agreement in number between subject and verb, I would hazard a guess that most speakers of English would be surprised by such facts of phonology as the change from voiced to unvoiced past tense markers ([d] to [t]), depending on phonetic environment, or the lengthening or nasalization of vowels in certain contexts (e.g. bæt versus [bǣg]).

The ability of children to achieve insights into the phonological structure of language is especially important in the context of learning to read an alphabetic orthography. Roughly speaking (perhaps very roughly in the case of English) one grapheme stands for one phoneme. We may expect that any child who fails to achieve at least some minimal insight into the way the sound stream breaks up into the articulatory/acoustic building blocks called phonemes will find the alphabetic principle particularly opaque. Evidence suggests that manipulating the sounds of language does not come naturally to children, and that the younger the child, the more difficult it is to extract evidence of metalinguistic awareness of phonological structure. Some examples follow.

Bruce (1964) asked children to say what was left when, e.g., /f/ was removed from /fæt/. Virtually no child five or younger seemed to understand the requirements of the task, at six about one-third of the sample could, and there was widespread competence at seven. Firth (1972) discovered that this elision ability correlated quite strongly with reading

ability, a fact confirmed by Lynn Arnold in my laboratory, of which more later.

The difficulty young children, and older ones with reading difficulties, have in dealing with surface (phonological) structure also extends to memory coding. Conrad (1972) noted that children below age six were not much affected in serial recall of pictured items by introducing acoustic confusability into the items' names (bat, bag, cat, e.g.), but older subjects were. Shankweiler and Liberman (1976) found something similar among children with different levels of reading skill - poorer young readers were less confused by phonetic similarity in to-be-recalled letter strings than were good readers.

More generally, and ignoring for the moment the correlation with reading skill, children and adults have at their command a complex phonological system about whose structure there is little natural reflection. Thus the failure of most peoples to develop a way of recording the sounds of their languages may stem from a feature of human cognition which we can observe in children and (less systematically) in adults, even in a literate society. People can readily use language to convey meaning, but rarely contemplate its form.

Some recent experiments in my laboratory

I now turn to some studies conducted by me and my students in the past few years which confirm and, hopefully, extend the previously-described ideas of the cognitive status of spoken and written language.

Firstly, Peter Shea and I set out to confirm that young retarded readers were relatively insensitivie to phonetic aspects of words, using a memory experiment (full details are in Byrne and Shea, in press).

Adapting a technique devised by Felzen and Anisfeld (1970), we made up a long list of words, to be spoken to the child, along the following lines; there were twelve words called antecedent (A) words, which each had paired with them (a) another word which was semantically similar (a synonym or antonym) and (b) another which rhymed (e.g., the A-word home was paired with (a) house and (b) comb). Each A word was presented twice, separated by some eight other items. Each paired item (S for the

semantic relation, R for rhyming) was presented once, following its A word by nine or fourteen spaces. Each S and R word had, in turn, a control (CS and CR) mate, matched in aspects like frequency and part of speech but otherwise unrelated (e.g., the S word house there was ship, and for comb (R word), glove). These C items preceded or followed their S and R counterparts by two spaces. Another 49 filler items made up the entire list of 121 words. The words were auditorily presented to the children, with 5½ seconds between items, and their task was to say whether they had heard each word previously in the list ("old") or not ("new").

We were especially interested in the false positive error rate to S and R items. That is the number of times the subjects erroneously say "old" when these items are presented. We were to take this error type (or, more strictly, the difference between false positives to S and CS items, and to R and CR) as a sign that the child was using a semantic code (in the case of S false positives) or a phonetic code (in the case of R false positives) in storing the items. More concretely, if a subject says "old" to house when only home had been in the list before we can assume that storage in terms of semantic features is operating (assuming he doesn't also say "old" to house's control, ship). Likewise, an "old" response to comb indicates a surface (sound)-based coding system (again, once false positives to CR items have been subtracted). This technique has been used successfully in exploring memory coding in deaf children (Fromkin & Anisfeld, 1977).

Our subjects were 15 good and 15 poor readers, the latter defined as being a year or more below their chronological age on a standardized word-reading test. The mean chronological and reading ages of the good readers were 7 : 5 and 8 : 7 respectively; for poor readers the relevant figures were 7 : 6 and 5 : 11. The groups were matched for IQ.

The main results are in Table 1. We have reported only the mean differences between number of false positives to S and CS, and R and CR items. (Overall error rates of all sorts are comparable for the two groups).

Table 1

Mean differences between false positives to experimental (S and R items) and control (CS and CR items).

| | S-CS | R-CR |
|---|---|---|
| Good readers | 1.34 | 1.40 |
| Poor readers | 2.40 | 0.07 |

These means generate a significant interaction ($F(1,23) = 12.87$). Poor readers made a large number of semantic confusions (home/house type) but virtually none based on rhyme (home/comb). The coping readers seemed to store in terms of both meaning and sound, judging from their tendency to make errors based on both codes (both means are significantly above zero). We thus confirmed previously reported findings of weakness among poor readers in utilizing the sounds of words as a basis for storage.

It would be consistent with my earlier argument to interpret our findings thus; the poor readers are showing a natural, maybe "primitive", tendency to think about words as standing for things. Words are not objects in themselves to these children, but deeply rooted in their rich semantic networks. William Stern (1914/1971) would concur, I believe. He, more than most observers of childhood language, was persuaded that for children linguistic form and meaning are intimately bound. The relationship, he asserted, was two-way: "The thing itself gains from the fact that it can be named, an increase in stability and permanence, and the name from its firm anchorage in the structure of the thing takes on some touch of its physiognomy; it sounds as the thing looks or moves or feels to the touch - a species of sound painting which now appears side by side with the natural utterance" (1971, p.47). Thus it may be that focussing upon the form of a word, its sound, may run into stiff competition from the predominant reaction, to its meaning. I think this strong tendency to interpret stimuli, to assign them to a cognitive category, can be seen in all of us. The difficulty of listening to someone speaking your native tongue and hearing "mere sounds", or the trouble we experience in having once seen a face in a cloud pattern, of again seeing "just clouds", are examples. Tasks which ask children to divorce form and meaning in language so as to analyze the physical signal invite them to move in part away from an important aspect of their linguistic experience, that names stand for things, and to treat the name itself as an object. Now of course children can do exactly that, as evidenced by the performance of our good readers in this experiment and, it seems, by the fact that most children learn about sound structure in the course of reading acquisition. But there may be a minority of children who have a particularly hard time separating form and meaning, despite hints at their independence contained in most reading instruction programmes, and who thus fail to achieve the insights into the sound stream necessary to support smooth mastery of reading.

However there may be a more prosaic interpretation of our experimental results - simply that the poor readers have weaker phonetic memory stores and hence direct their resources to coding in terms of semantic properties. That is, it may not be that meaning has a positive valence, but that the surface code has a negative one. Our test of this hypothesis consisted of giving the same children a similar task, but using phonetically legal meaningless sound strings instead of real words. If poor readers can code sounds as reflected in an above-zero rate of false positive to rhyming items, it would suggest that they do have an adequate STM for surface form and that the earlier results reflected a preference for semantic coding rather than paucity in storage of surface features.

The items were created by changing the first phoneme of the A words of our first experiment (e.g. home → jome). Rhyming items were similarly produced (comb → vome). In all other respects the item list was the same as our earlier one, except of course that there was no semantically related items or their controls. There were 64 pseudo-words in the list, including filler items.

This time poor readers did make significantly more false positive errors on R items than on their controls. The mean difference was 1.93, significant beyond the .01 level. It seems as if these children could use a phonetic memory code when the items lack meaning. We also found a high rate of false positives among the good readers, higher in fact than the poor group (a mean of 3.73 more "old" responses to rhymes of A words than to the control items). Thus the sensitivity to the surface code is still weaker in poor readers than in those who are reading adequately. It seems that for some children speech is simply not as powerful a memory code as it is for others, but the "distraction" of meaning may mask some of the potency it can have.

I now mention briefly two other experiments which converge upon the results just mentioned. Both concern the effect of meaning variables upon poor readers' skill at manipulating rather than storing word forms. In the first, we asked 11 poor second-grade readers to elide the last syllable from (a) a list of regular words like carpet, napkin, and window, and (b) a list of pseudo-words produced by rearranging the elements of the regular words (carpin, napkow, windet, etc.). The children performed better with the non-words than the real ones (means of 5.3 and 4.1 respectively), significant beyond the .05 level with a t-test. Finally, with yet another group of 15 retarded readers from second grade, Lynn Arnold demonstrated some facilitating

effects of a word's lexical structure. She had her subjects elide the first syllable from regular words (e.g. monkey, perform, turban) and from compound words (snowman, frypan, armchair, etc.). The derivation of snowman provides an insight into its major physical constituents, cues available to anyone who has mastered the lexicon (c.f. snowball, snowflake; milkman, postman). The error rate with our subjects dropped from 30% to 11% with the shift from regular to compound words, a highly significant change ($p < .01$). It appears that poor readers can readily isolate the syllabic units in words when they correspond to lexical units, again demonstrating their sensitivity to semantic structures. (Comparisons with good readers are hard to make on syllable elision tasks because of ceiling effects with those children. They have very little trouble breaking words up into syllabic or phonemic units).

Thus, what I have presented is a loose confederation of observations and experimental results which suggest that reflecting upon the surface features of language does not come naturally to people, and symbolic systems which tap into language at this level pose greater cognitive demands than may appear at first glance. The course of the development of spoken language and its subsequent use seems firmly rooted in cognitive capacity. Coming to terms with sound-based orthographies represents a more deliberate and effortful step, closer to the boundaries of capacity. No child with an intact neuro-muscular system and psyche fails to learn to talk. Many fail to master the demands of an alphabetic writing system, and part of the trouble may be the very centrality of language in cognitive structure and ideation.

Some rather striking evidence that orthographies which represent meaning and words without the need for an intervening sound-stream analysis are easier to learn about comes from Rozin, Poritsky, and Sotsky (1971). They successfully taught reading-disabled second-graders to identify some 30 Chinese characters with English words and to read stories written with these characters. Chinese is, in essence, a logographic system (one symbol, one word), and providing the correct pronunciation does not demand an understanding of word structure. English writing, which the children had failed to learn, does.

Directions for further research

At least one knotty problem remains unsolved by the laboratory studies

I have outlined. In the experiments Peter Shea and I conducted, and in some others reviewed here, a correlation between phonetic sensitivity and reading skill emerges. I am tempted to believe, as others are (e.g. Rozin and Gleitman, 1977), that for some children difficulty in acquiring reading skill may stem from a weak grasp of phonological structure. But of course things may be the other way round. It may be that these children, for unknown reasons, have trouble mastering reading and hence do not discover how spoken words decompose into smaller units. In other words, it may be reading instruction itself which induces phonetic sensitivity and manipulative skill. This chicken-and-egg problem can best be tackled, I think, by a training programme aimed at developing phonological awareness prior to or during the very early stages of reading instruction and observing the effects upon the subsequent course of reading acquisition. If children who are taught to be sensitive to rhyme, who can elide and blend sound segments, in general, who can deal with sounds as separate entities, prove to be the fastest learners then my hunch will be supported. A resolution of this issue is important because of its consequences for curriculum design and for potential remediation of those older children who are still struggling with what orthography is all about.

References

Bruce, D. J. The analysis of word sounds by young children. British Journal of Educational Psychology, 1964, 34, 158-170.

Byrne, B., & Shea, P. Semantic and phonetic memory codes in beginning readers. Memory and Cognition, in press.

Conrad, R., Speech and reading. In J. F. Kavanagh & J. G. Mattingly (Eds.), Language by ear and by eye: The relationships between speech and reading. Cambridge, Mass.: MIT Press, 1972.

Felzen, E., & Anisfeld, M., Semantic and phonetic relations in the false recognition of words by third- and sixth-grade children. Developmental Psychology, 1970, 3, 163-168.

Firth, I., Components of reading disability. Unpublished doctoral dissertation, University of New South Wales, Kensington, N.S.W., Australia, 1972.

Fromkin, B. & Anisfeld, M. Semantic and surface codes in the memory of deaf children. Cognitive Psychology, 1977, 9, 475-493.

Gelb, I. J. A study of writing: The foundations of grammatology. Chicago: University of Chicago Press, 1952.

Lenneberg, E. Biological foundations of language. New York: Wiley, 1967.

Rozin, R., & Gleitman, L. R. The structure and acquisition of reading II: The reading process and the acquisition of the alphabetic principle. In A. S. Reber & D. L. Scarborough (Eds.), Toward a psychology of reading: The proceedings of the CUNY Conference. New York, Lawrence Erlbaum, 1977.

Rozin, P., Poritsky, S., & Sotsky, R. American children with reading problems can easily learn to read English represented by Chinese characters. Science, 1971, 171, 264-267.

Shankweiler, D., & Liberman, T. J. Exploring the relations between reading and speech. In R. M. Knights & D. T. Bakker (Eds.), The neuropsychology of learning disorders. Baltimore: University Park Press, 1976.

Stern, W. Psychologie der frühen Kindheit. In A. Bar-Adon & W. F. Leopold (Eds.) Child Language: A book of readings. Englewood Cliffs, New Jersey: Prentice Hall, 1971. (Originally published 1914. Translated by A. Barwell and published as Psychology of Early Childhood).